

TECHNOLOGY REVIEW STUDY

IDENTIFYING SIGNIFICANT EMERGING TECHNOLOGIES AND UNDERSTANDING IMPACTS

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Wider, longer buses maneuvering on roadways designed for smaller vehicles; ships capable of carrying 5,000 containers; telecommuting from a virtual office: these are just some of the technological changes that will affect the New York–New Jersey region and the nation in the near future, according to a study released in 1994 by the Port Authority of New York and New Jersey.

The Port Authority, a bi-state agency, was established by Congress in 1921 to serve the people of the metropolitan area by developing, operating, and maintaining facilities and transportation systems that strengthen the region's economy. The Port Authority operates the region's major airports—John F. Kennedy International, LaGuardia, and Newark International—as well as other aviation facilities in the region. The agency also manages the bridges and tunnels that connect the two states, the Port Authority Trans-Hudson (PATH) rail system, maritime facilities in both states (including Port Newark–Elizabeth), and the World Trade Center.

Like other organizations, the Port Authority identifies, assesses, and responds to new and emerging technologies. Thoughtful and systematic integration of these technologies into the agency's business and capital planning and into facility operation and maintenance enhances its ability to serve its customers, increase facility capacity, better comply with regulations, and strengthen organization efficiency. In addition, the Port Authority has pioneered the development

and application of several new technologies, including the world's first containerport and the new engineering techniques used to build the World Trade Center.

The agency undertook the Technology Review Study to identify those new and emerging technologies that are most likely to significantly affect its core businesses—aviation, maritime, surface transportation, and commercial real estate—in the next 15 years. On the basis of interviews with 145 experts outside the agency and more than 80 staff members, 17 major technologies with potentially significant impacts were identified.

STUDY METHODOLOGY

The study team conducted literature scans, involved staff knowledgeable in key technology areas, and disseminated information obtained from external interviews. The steps taken in the study are listed in the box below.

An extensive literature review and meetings with staff members helped the study team develop a preliminary list of significant technologies for each core business area and a list of external experts to interview. The external experts were also asked to suggest individuals to be contacted. To benefit from differing perspectives on the significance and impact of various technologies, the researchers interviewed external experts from a broad range of backgrounds, including representatives of manufacturers, governmental agencies, academia, Wall Street firms, and competitor facilities.

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STEPS IN PORT AUTHORITY OF NEW YORK–NEW JERSEY TECHNOLOGY REVIEW STUDY

1. Initial literature reviews and review of departmental business plans.
2. Initial meetings with line-department staff.
3. Additional literature reviews.
4. Interviews with external experts.
5. Synthesis and initial analysis of external interview information.
6. Meetings with line-department staff and executive management to discuss findings.
7. Completion of analysis.
8. Dissemination of findings.

More than 100 technologies were identified by experts during the interviews. The study team applied three criteria to ascertain the most significant emerging technologies from this list: magnitude of potential impact, magnitude of potential barriers, and timing.

Magnitude of potential impact is defined as the extent to which widespread commercial use of the technology would affect the agency's ability to enhance the quality of customer service, increase revenues or decrease expenditures, or meet or exceed environmental and safety standards. The magnitude of potential barriers is the extent to which various factors will impede the widespread commercial use of the technology. Examples of such factors include technical and regulatory hurdles to overcome, market and demand considerations, and the availability of alternative technologies. Timing refers to the immediacy with which the agency must make or modify significant capital investments to respond to the potentially widespread use of a technology.

STUDY FINDINGS

On the basis of these screening criteria, the study team identified 17 emerging technologies that could significantly affect the agency in the near or immediate future (see box on page 15). These technologies were grouped into five cross-cutting categories: major new products likely to be introduced by customers or suppliers to whom the agency must respond in order to remain competitive and responsive to customer needs; environmental and safety technologies that could help

the agency achieve its objectives in these areas, as well as meet federal and state requirements; information- and telecommunications-based technologies that offer new opportunities but also pose particular challenges because of their rapid pace of development; new products that could improve the agency's competitiveness or customer service, increase the capacity of facilities, and expand the demand for facilities and services; and substitutes for the agency's core businesses that could change the marketplace by offering alternatives to traditional ways of doing business or modes of transportation.

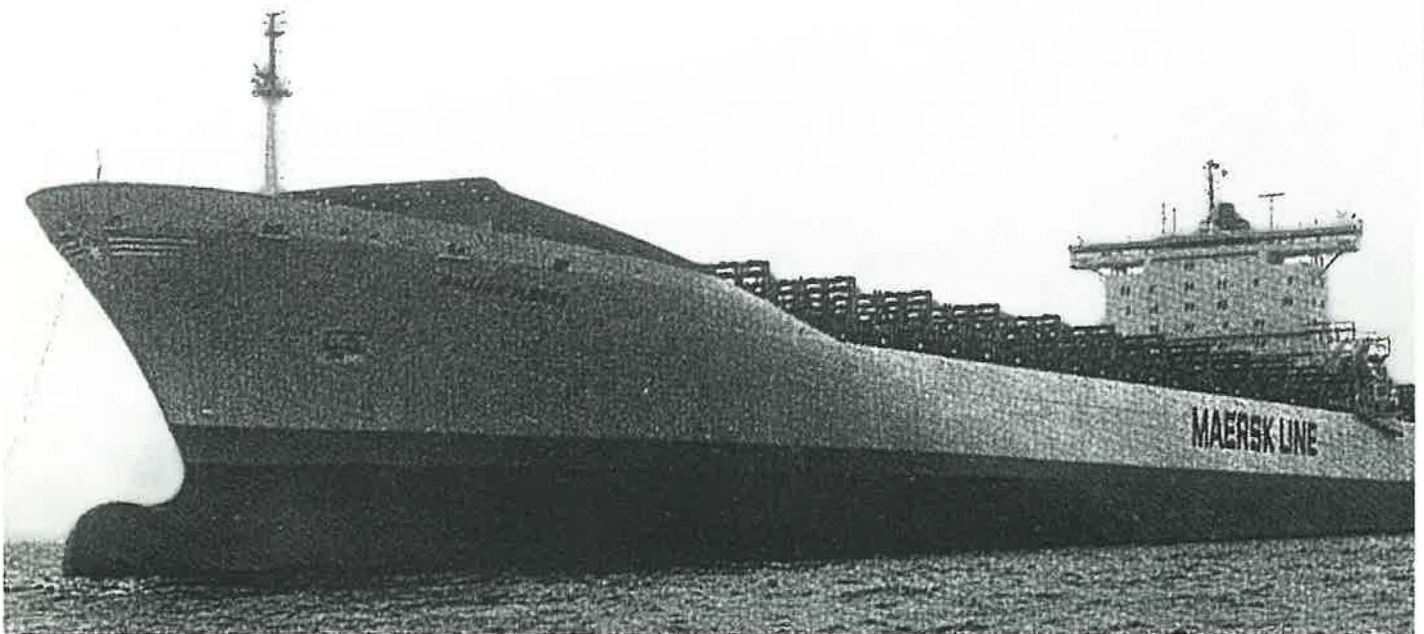
SIGNIFICANT TECHNOLOGIES

Among the significant emerging technologies identified in the study were post-Panamax container vessels, new bus designs, alternative-fuel vehicles, and telecommuting.

Post-Panamax Container Vessels

Post-Panamax container vessels, so named because they are either too wide or too long to go through the Panama Canal, are already in service in the Pacific Ocean and will eventually enter service in the North Atlantic, according to the experts interviewed for the study. The vessels can hold more than 5,000 Twenty-Foot Equivalent Units (TEUs) or 20 percent more cargo containers than the largest vessel now using the New York–New Jersey region's container ports, but require at least 12.8 to 13.7 meters (42 to 45 feet) of channel depth. Nearly 100 of these vessels are now in use, under construction, or planned. The

Recently launched post-Panamax container vessel Regina Maersk can carry more than 6,000 Twenty-Foot Equivalent Units.



Regina Maersk, a recently launched container ship, can carry in excess of 6,000 TEUs. Some shipping firms are considering even larger vessels.

Post-Panamax vessels generate several issues for the Port Authority and its terminal operators. For example, without further dredging, the current channel depth would preclude these vessels from entering many of the port's terminals fully loaded. Dredging and dredge disposal are top priorities for the New York–New Jersey region. Without channel deepening, there is considerable concern that vessels will first call at competing ports in North America to off-load containers and lighten loads. Indeed, the press has already noted that several steamship lines are now calling on Halifax, Nova Scotia, to lighten their loads before calling on the Port of New York and New Jersey.

In addition to the need to address channel issues, the Port Authority must make additional investments in terminal infrastructure to handle these vessels. For example, post-Panamax gantry cranes, which are taller and wider than standard gantry cranes, will be necessary to effectively handle the cargo (several such cranes have already been installed at the port, but more will be needed). Additional terminal automation may be required to handle the increased number of containers per vessel. Although the post-Panamax vessels are larger, steamship lines are seeking the same turnaround times at maritime terminals to maintain vessel efficiencies.

New Bus Designs

Commuter buses are rapidly changing as transit operators begin using alternative fuels and respond to the provisions of the Americans with Disabilities Act. The emerging industry standard for commuter buses, for example, calls for vehicles that are 260 centimeters (102 inches) wide instead of 243 centimeters (96 inches) wide. In addition, some new buses will be 13.7 meters (45 feet) long, which is 1.5 meters (5 feet) longer than the current standards.

These longer, wider buses could present operational challenges at the Port Authority's tunnels and midtown-Manhattan bus terminal. For example, until recently 260-centimeter (102-inch) buses were not allowed in the Lincoln Tunnel's exclusive bus lane because of the 3-meter (10-foot) lane widths. However, on-site tests, combined with the findings of consultants with the National Transportation Safety Board and the New Jersey Transit Corporation, suggest that the wider buses can safely use the express bus lanes.

Alternative-Fuel Vehicles

Alternative fuels for buses and other vehicles are being tested to help the region meet air-quality requirements. Alternative-fuel transit vehicles, including compressed natural gas vehicles, liquefied natural gas vehicles, electric buses, and hybrid electric-diesel buses, have gained importance through the Clean Air Act Amendments

Current alternative-fuel vehicles, which offer solutions to air-quality problems in metropolitan areas, also pose technical challenges for transportation systems, such as need for new types of fueling stations and limits to travel distance.



PIERCE COUNTY TRANSIT, WASHINGTON STATE

because lower emissions make them attractive in nonattainment areas such as the New York–New Jersey Region. A number of technical challenges remain, including limited traveling range, and—a specific consideration for electric vehicles—battery life. New types of fueling stations would also be needed to service these vehicles. Safety concerns, including chemical spills or ruptures of tanks in the event of an accident, remain.

The Port Authority has made a commitment to purchase and encourage the use of alternative-fuel vehicles as a solution to regional air quality concerns. In cooperation with Elizabethtown Gas, the agency opened a CNG fueling station at Port Newark–Elizabeth. The agency is also working with the New York Power Authority on alternative-fuel vehicle use at the airports. Currently some forms of alternative-fuel vehicles are allowed through the Holland and Lincoln Tunnels (e.g., electric, methanol, and compressed natural gas). However, liquified natural gas vehicles are not permitted.

Telecommuting Technologies

Increasingly, workers are working out of their homes, customers' offices, or on the road instead of in permanent offices. Telecommuting refers to a set of telecommunications and computer technologies that allow people to work outside the traditional office environment. Although this innovation has been discussed for a long time, several factors have recently combined to accelerate its use. These factors include the introduction of more advanced computer and telecommunications technologies, the realization by firms that they could significantly cut their overhead for office space by encouraging employees to work off site, and the effectiveness of telecommuting in disaster recovery after the World Trade Center blast and the Los Angeles earthquake.

Telecommuting has uncertain implications for surface transportation facilities. Some peak-period congestion could be reduced if there are fewer commuters, but there could be more traffic throughout the day if employees are encouraged to spend more time on the road. Indeed, a recent U.S. Department of Energy study concluded that telecommuting may actually increase vehicle-miles traveled.

As the owner and operator of the World Trade Center and the Newark Legal Center, along with interests in the Teleport Office complex, the Port Authority also assesses how telecommuting influences the demand for office space and the type of space desired. Telecommuting may decrease the overall demand for space and influence the type of

SIGNIFICANT EMERGING TECHNOLOGIES IDENTIFIED IN TECHNOLOGY REVIEW STUDY

Major New Products Likely To Be Introduced by Port Authority Customers or Suppliers

- Global positioning system
- New large aircraft
- Post-Panamax container vessels
- Alternative-fuel vehicles
- New bus designs
- Intermodal truck/rail freight equipment

Environmental and Safety Technologies

- Deicing technologies
- Security technologies
- Environmental monitoring technologies

Information- and Telecommunications-Based Technologies

- Advanced traffic management systems
- Automatic equipment identification (including electronic toll collection)
- Electronic data interchange

New Products That Could Be Introduced To Improve Competitiveness or Customer Service

- Office-building technologies
- Baggage-handling technologies
- Maritime-terminal technologies

Substitutions for Agency Core Businesses

- High-speed rail
- Telecommuting technologies

space required by employees. Work spaces may need to be more flexible and more easily reconfigured to accommodate changing business needs. More meeting space will be needed because meetings may be a primary reason that employees journey to the central office. Finally, new office space will require more electric power and shielding to accommodate more portable computers, faxes, copy machines, cellular phones, and other portable office equipment. Additional shielding is necessary, according to some engineers, so that signals from one company's equipment do not interfere with those from another company's equipment.

The Technology Review Study helped the agency identify key technological developments and issues. The study also brought together technology experts within the Port Authority, leveraging a valuable internal resource. Foremost, it confirmed some agency business understandings while suggesting modifications to others.

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